

**ICT and the mismatch between higher education and employment “the Algerian labor market case”****تكنولوجيا المعلومات والاتصال وحالة قصور العلاقة تعليم عالي-عمل " سوق العمل الجزائري نموذجاً "****Maamri Fatma<sup>1</sup>, Ouhabda Nourelhouda<sup>2</sup>, Lassassi Moundir<sup>3</sup>, Rouaski Khaled**<sup>1</sup> doctoral student; ENSSEA - Algiers (Algeria), maamri.fatma@enssea.net<sup>2</sup> doctoral student; ENSSEA - Algiers (Algeria), ouhabda.nourelhouda@enssea.net<sup>3</sup> CREAD - Algiers - Algiers (Algeria), m.lassassi@cread.dz<sup>4</sup> UNIVERSITY OF Algiers3 - Algiers (Algeria), rouaski\_khaled@enssea.dz

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**Received:** 15/01/2024**Accepted:** 29/03/2024**Published:** 31/03/2024**Abstract:**

The main reason for the high unemployment rate among graduates of higher education in Algeria is the insufficient relationship between education and work, according to a report by the World Bank on the situation of Algeria in 2017, given that information and communication technologies are characterized by many advantages, especially by providing job opportunities for the unemployed. Through this article, we will explain the phenomenon of educational mismatch, in beginning and information and communication technologies, then we will move on to explain how they contribute to reducing educational mismatch, with reference to the case of Algeria, for this purpose we using the systematic review of the studies related to the subject of this study for the period 2000-2020.

**Keywords:** ICT; mismatch; Higher education; Job; Algeria**JEL Classification Codes :** I23, J2, J5, O3**ملخص:**

يعتبر السبب الرئيسي لارتفاع معدل البطالة بين خريجي التعليم العالي في الجزائر عدم كفاية العلاقة بين التعليم والعمل حسبما جاء به تقرير للبنك الدولي حول حالة الجزائر لسنة 2017 ، نظرا لأن تكنولوجيا المعلومات والاتصال تتسم بالعديد من المزايا لا سيما من خلال توفير فرص العمل للعاطلين عن العمل، سنوضح من خلال هذا المقال ظاهرة عدم التطابق التعليمي بداية وتقنيات المعلومات والاتصال ثم سنتقل لتوضيح كيفية مساهمتها في الحد من عدم التطابق التعليمي مع الإشارة إلى حالة الجزائر، ولهذا الغرض سنستخدم المراجعة المنهجية للدراسات المتعلقة بموضوع الدراسة للفترة 2000-2020.

**كلمات مفتاحية:** تكنولوجيا المعلومات والاتصالات؛ عدم كفاية؛ تعليم عالي؛ عمل؛ الجزائر

**تصنيفات JEL:** I23, J2, J5, O3

## **Introduction:**

Algeria had to adopt a development strategy for the ICT sector and it has made significant progress in this direction, since the commissioning of the Internet by the research center on scientific and technical information CERIST (1993) which has expanded the scope of uses of information and communication technologies in many areas and currently wants to digitize all Algerian government sectors.

Digitalization has also affected the higher education sector, which has had a positive impact, particularly during the Covid-19 health pandemic.

## **Research Problem:**

But how does it contribute to reducing the mismatch in the higher education-employment relationship during the period 2000-2020?

## **Research hypothesis:**

Information and communications technology contributes to providing a significant number of job opportunities.

## **Research objectives and methodology:**

This study aims to understand the concept of information and communication technologies and the concept of the training-employment mismatch, and to identify the role of ICT in reducing this mismatch; and for this purpose, we will adopt a systematic review by reviewing studies related to the subject of the study.

## **Subdivision of the study:**

This work will be presented as follows

- 1-general overview of information and communication technologies.
- 2-theoretical frameworks of the training-employment mismatch.
- 3- inventory of the situation of the ICT sector and the inadequacy experienced in Algeria for the period 2000-2020.

## **Literature Review:**

Digitization today is considered a necessity imposed by international changes. (Mimoune and Mairif 2023) study confirmed this idea and made it clear that digital transformation is a necessity that Arab countries in general and Algeria in particular must adopt in all their institutions. Algeria Telecom is considered a pioneer in the field of digital transactions, but it requires more performance to fully digitize all its transactions. Considering that higher education is the most prominent factor contributing to the economic growth of countries, its digitization can contribute to improving the performance of its individuals. (zine and Terbeche 2023) study clarified the factors contributing to the digital transformation of higher education. It reached the importance of both infrastructure and digital skills and senior management support. Both digital education and the electronic library represent Two indicators of digital readiness in institutions of higher education and scientific research. Numerous studies, including that of (lassassi and Muler 2013) showed that social networks have a positive impact on job searches in Algeria, but not for jobs requiring qualifications. The study (Ragui and Caroline Craft 2018) confirmed the previous idea for the Egyptian labor market where social networks effectively contribute to the employability of young graduates. The study of (G.Metu and Emmanuel Ajudua 2021) has proven the positive impact of ICT in reducing unemployment in Sub-Saharan Africa, and it also recommends the need to implement further reforms in the field of

communications to reduce the costs of mobile telephony technologies and improve facilities internet in the region.

### **1-General overview of information and communication technology:**

The current era is characterized by the explosion of knowledge and technology, the spread of communication systems, the increasing use of computers and the use of the Internet, which has made the world a digital village. Advances in the field of information and communication technologies have become extremely important for building an efficient economy based on knowledge and information, but what do we specifically mean by information and communication technologies?

#### **1-1 Definition of ICT:**

The United Nations Educational, Scientific and Cultural Organization (UNESCO) defines information and communication technologies " as a diverse set of technological tools and resources used to transmit, store, create, share or exchange information. These technological tools and resources include computers, the Internet (websites, blogs and emails), live broadcast technologies (radio, television and webcasting), recorded broadcast technologies (podcasting, audio and video players and storage devices) and telephony (fixed or mobile, satellite, vision/videoconferencing, etc.). » (UNESCO 2009, p.120)

#### **1-2 ICT indicators:**

The International Telecommunications Union has identified ICT measurement indicators, the most important of which are (ITU 2014, pp.214-215).

##### **1-2-1-Fixed telephone networks:**

A telephone line connecting a customer's terminal equipment (e.g. telephone set, fax machine) to the public switched telephone network (PSTN) and which has a dedicated port on a telephone exchange. This term is synonymous with the terms main station or direct exchange line (LED) commonly used in telecommunications documents. It may not be the same as a dial-up line or subscription.

##### **1-2-2-Mobile phone network:**

Mobile phone subscribed to a public mobile telephone service using cellular technology, which provides access to the PSTN. This includes analog and digital cellular systems and technologies such as IMT-2000 (3G) and IMT-Advanced. Users of postpaid subscriptions and prepaid accounts are included.

##### **1-2-3-The Internet:**

A global public computer network. It provides access to a number of communications services, including the World Wide Web, and carries e-mail, news, entertainment and data files regardless of the device used (it is not assumed that this is only via a computer – this can also be via a mobile phone, PDA, games console, digital TV, etc.). Access can be via a fixed or mobile network.

### **1-3 The theoretical framework of the contribution of technical progress on economic growth:**

Economists have divergent opinions on the impact of technology on the training-employment relationship: some see it as a negative impact which contributes to the emergence of unemployment, like Karl MAX according to which for him the main cause of long-term unemployment in the capitalist system and technical progress. Joseph Schumpeter explained through economic cycles that the emergence of innovation at the beginning has a negative impact on jobs and professions because it will make some of them disappear and the adaptation of workers to new technologies is difficult,

but that after a certain time, this will have a positive effect by encouraging demand, production and earnings will be redistributed in the form of social benefits by the state for the unemployed.

(زكي 1998).

According to Joseph Schumpeter, innovation is the basis of economic change through creative destruction which is considered to be the engine of economic development.

In his theory he refers to the entrepreneur (Śledzik 2013, p.90) who explains that his work must depend on the discoveries of inventors to be able to establish forms of contribution by offering employment opportunities.

(M.Solow 1957, p.312) on his part underlined the importance of technical development as an external variable positively affecting the rate of economic growth and their work constituted the starting point of Paul Romer (Zhao 2019, p.64) who underlined the contribution of technical progress on sustainable economic development.

Currently, research work is focused on the contribution of ICT to increasing worker productivity such as the study of (Akande and Maryam 2017), (Cette and Sandra 2020), (LADHA and Aviral 2022).

## **2- Inadequacy higher education – employment:**

(Quintini 2010, p.9) Said in a study published by the Organization for Economic Co-operation and Development “OECD” that due to technological change, the phenomenon of mismatch in the education-work relationship will increase over time.

We will explain what it is below

### **2-1 Definition of the inadequacy phenomenon:**

Modern labor markets are characterized by the rigidity of wages, the imperfection of information, etc. and these deficiencies have caused the emergence of various imbalances including the inadequacy between the knowledge of higher education graduates and the requirements of the employment constitutes one of the forms of inadequacy of the training-employment relationship.

(Quintini 2011, p.8).

Among the definitions that have been developed to define educational mismatch, we will cite the definition given by the Organization for Economic Cooperation and Development “lack of harmonization of qualifications and skills” which means in English “skills – mismatch”, represents a gap that requires measurement that occurs between a person's abilities and those required by their job. Since qualifications (qualification level) are an imperfect proxy for people's skills, therefore qualification mismatch does not always mean skills mismatch. » (ibid)

The International Labor Office for its part addressed the phenomenon of training-employment mismatch and indicates that the concept of skills mismatch is a very broad concept and can include different types (McGuinness and Constantinos 2017, pp:1-2), it can be used to describe vertical mismatch (generally measured in terms of over-education or under-education-over-skill or under-skill), skills shortages, horizontal imbalance (by field or specialty of study), and obsolescence of skills.

(OIT 2014, p.5) Also stated that unemployment can be considered a type of mismatch.

According to the aforementioned definitions, we can formulate the following definition of the term training-employment mismatch *which represents an imbalance in the labor market indicating the presence of a supply of highly qualified graduates which differs from the demand of establishments, both in terms of quantity or how this situation could arise due to several factors such as increased*

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*demand for higher education, which affects the quality of education and other factors related to demographic, economic, technical and even political changes.*

An incompatible education-work relationship leads to a drop in the salaries of newly recruited people, and it can also lead to difficult professional integration of young people and women graduates and this situation results either in job dissatisfaction or unemployment.

We conclude that educational mismatch can take many forms and have many consequences for both individuals and economies.

As an indication, the imbalance in the education-work relationship is detected either through the low rate of professional integration, the high unemployment rate, or through national and international classifications on the quality of education and the quality of work.

### **2.2 ICT as a factor in the fight against educational inadequacy:**

(83) (قلبازة و عابد 2015 ص. 83) Recommends the following measures so that ICT can effectively contribute to reducing unemployment

- encouraging creativity and establishing small businesses that operate in the digital content industry.
- the establishment of an immense industrial base equipped with a capacity for diversified material and human equipment comparable to those of many countries in the world.
- the establishment of extensive and solid bridges with developed countries which have advanced in the fields of research and technology.
- ensure political stability by improving the business climate
- bring the human element quantitatively and qualitatively through continuing training.
- support research institutions through grant and award schemes

### **3. The Algerian labor market case:**

If ICT improves the productivity of productive activities, they also offer opportunities for the emergence of new activities. We will discuss below the general situation of the information and communication sector in Algeria during the period 2000-2020 and some labor market indicators which concern the relationship higher education and employment for the same period and at the end we will present the most remarkable contributions of ICT made in the context of job creation.

#### **3.1 Status of the evolution of some ICT indicators during the period 2000-2020:**

The ICT sector has undergone remarkable development in Algeria since the beginning of 1990 and its opening to individuals has become possible thanks to the reforms due to this sector since 2000.

In this section we will present the evolution of some ICT indicators during the period 2000-2020.

##### **3-1-1-Fixed and mobile telephone lines in Algeria (2000-2020):**

Fixed telephone subscriptions in Algeria experienced significant growth during the period 2000-2020 as shown in table (1) and graph (1)

**Table (1):** the evolution of fixed telephone subscriptions during the period 2000-2020

| Years | The evolution of fixed |
|-------|------------------------|
|-------|------------------------|

|             | <b>telephone<br/>subscriptions<br/>during the<br/>period 2000-<br/>2020</b> |
|-------------|-----------------------------------------------------------------------------|
| <b>2000</b> | 1761327                                                                     |
| <b>2001</b> | 1880000                                                                     |
| <b>2002</b> | 9501                                                                        |
| <b>2003</b> | 2079464                                                                     |
| <b>2004</b> | 2486720                                                                     |
| <b>2005</b> | 2572000                                                                     |
| <b>2006</b> | 2841297                                                                     |
| <b>2007</b> | 3068409                                                                     |
| <b>2008</b> | 3069140                                                                     |
| <b>2009</b> | 2576165                                                                     |
| <b>2010</b> | 2922731                                                                     |
| <b>2011</b> | 3059336                                                                     |
| <b>2012</b> | 3289336                                                                     |
| <b>2013</b> | 3132829                                                                     |
| <b>2014</b> | 3098787                                                                     |
| <b>2015</b> | 3267592                                                                     |
| <b>2016</b> | /                                                                           |
| <b>2017</b> | 4100982                                                                     |
| <b>2018</b> | 4164039                                                                     |
| <b>2019</b> | 4635217                                                                     |
| <b>2020</b> | 4785763                                                                     |

**Source:**

تكنولوجيا الاعلام والاتصال في الجزائر, مغيزلي نوال

Algerian review of security and development, volume 7, number 12, 2018, p 178

And

Report on the evolution of telecommunications service indicators for the year 2020, available on the website of the  
Ministry of Telecommunications, p3;

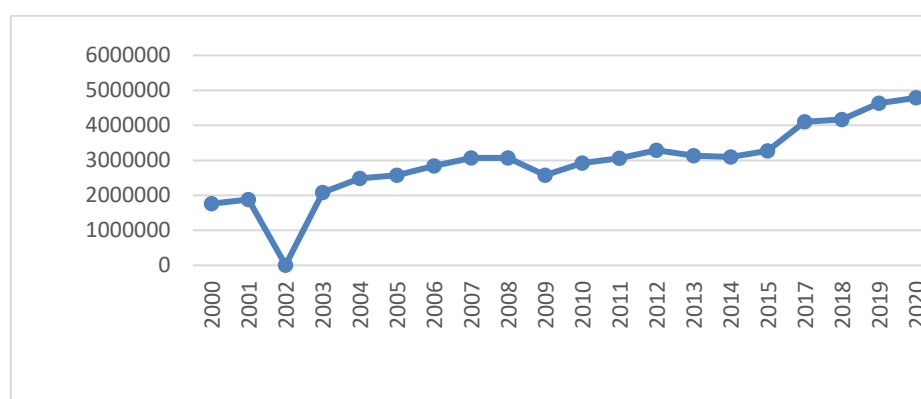
Available on

Rapport-indicateurs-TIC-Année-2022.pdf (mpt.gov.dz)

17/12/2023)

**Fig (1):** the evolution of fixed telephone subscriptions in Algeria during the period 2000-2020

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**Source:** our own contribution

The evolution of the number of fixed telephone subscriptions in Algeria has tended towards positive growth in recent years, knowing that it reached around 5 million subscriptions at the end of 2020.

As for the development of mobile telephony, it has in turn experienced a positive development, and this within the framework of the opening to competition of the public telecommunications market in Algeria, or in June 2001 one million residence and travel licenses. operations were sold and investment in mobile telephony and investments in mobile telephony began in Algeria and this market currently has three resellers: DJEEZY (2001), MOBILIS (2003), and NEDJMA -OREDOO- (2003) (ماضوي 2013 ص. 121)

The following table and graph show the evolution of the number of mobile phone users in Algeria during 2000-2020.

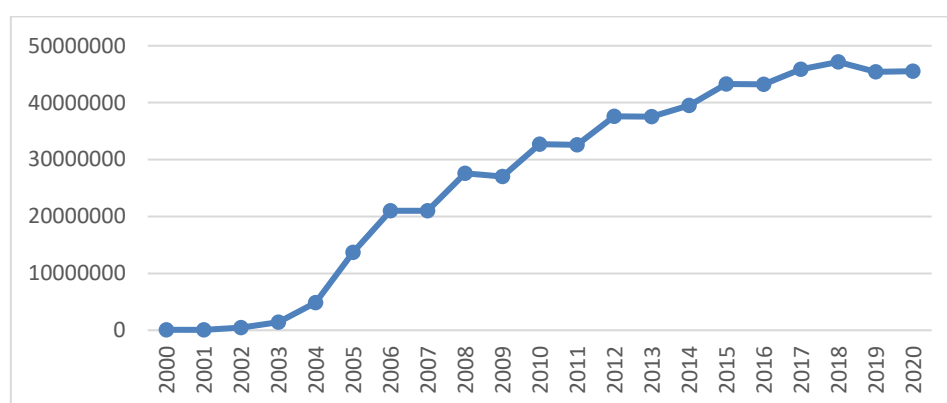
**Table (2):** the evolution of the number of mobile phone users in Algeria during the period (2000-2020)

| Years | The evolution of numbers mobile users during the period 2000-2020 |
|-------|-------------------------------------------------------------------|
| 2000  | 86000                                                             |
| 2001  | 100000                                                            |
| 2002  | 450244                                                            |
| 2003  | 1446927                                                           |
| 2004  | 4882414                                                           |
| 2005  | 13661355                                                          |
| 2006  | 20997954                                                          |
| 2007  | 20997954                                                          |
| 2008  | 27562721                                                          |
| 2009  | 27031472                                                          |
| 2010  | 32729824                                                          |
| 2011  | 32615926                                                          |

|             |          |
|-------------|----------|
| <b>2012</b> | 37615926 |
| <b>2013</b> | 37527703 |
| <b>2014</b> | 39517045 |
| <b>2015</b> | 43298174 |
| <b>2016</b> | 43227643 |
| <b>2017</b> | 45845665 |
| <b>2018</b> | 47154264 |
| <b>2019</b> | 45425533 |
| <b>2020</b> | 45555673 |

**Source:** World Bank data available on the site:  
Abonnements mobiles cellulaires - Algérie | Données (worldbank.org)  
17/12/2023)

**Fig (2):** the evolution of the number of mobile phone users in Algeria during the period (2000-2020)



**Source:** our own contribution

It is clear from the above that mobile telephone subscriptions have experienced significant growth, and this is mainly due to the implementation of the Internet service and 3G services (2014) and then of 4G.

### **3-1-2-Internet in Algeria (2000-2020):**

Algeria experienced its first connection to the Internet in 1994, through the Center for Research and Scientific and Technological Information (CERIST); and after the promulgation of Executive Decree No. 98-257 modified by the decree (n°307-2000 2000, p.1) specified the terms of operation of the Internet.

And in 2003 new providers cooperated with CERIST, as part of the expansion of the implementation of the Internet and will make it accessible to citizens, which contributes to the increase in the number of users of this network during from the period 2000-2020.

Table (3) represents the evolution of the proportion of Internet users in the total population during 2000-2020.

**Table (3):** the evolution of the proportion of Internet users in the total population during the period (2000-2020)

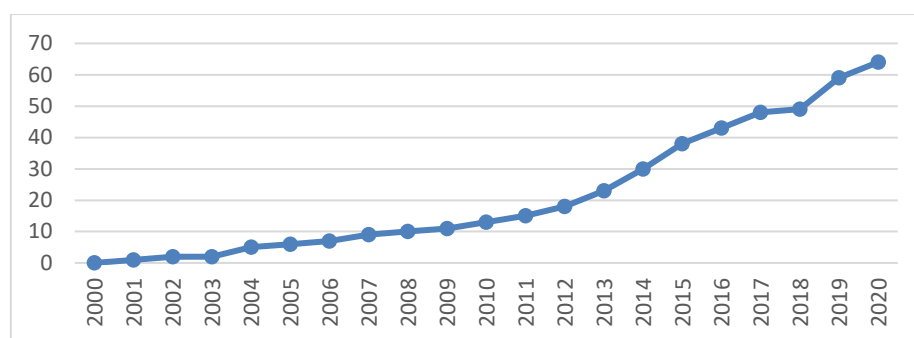
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| <b>Years</b> | <b>The evolution of the proportions of Internet users in the total population during the period 2000-2020 (%)</b> |
|--------------|-------------------------------------------------------------------------------------------------------------------|
| <b>2000</b>  | /                                                                                                                 |
| <b>2001</b>  | /                                                                                                                 |
| <b>2002</b>  | 2                                                                                                                 |
| <b>2003</b>  | 2                                                                                                                 |
| <b>2004</b>  | 5                                                                                                                 |
| <b>2005</b>  | 6                                                                                                                 |
| <b>2006</b>  | 7                                                                                                                 |
| <b>2007</b>  | 9                                                                                                                 |
| <b>2008</b>  | 10                                                                                                                |
| <b>2009</b>  | 11                                                                                                                |
| <b>2010</b>  | 13                                                                                                                |
| <b>2011</b>  | 15                                                                                                                |
| <b>2012</b>  | 18                                                                                                                |
| <b>2013</b>  | 23                                                                                                                |
| <b>2014</b>  | 30                                                                                                                |
| <b>2015</b>  | 38                                                                                                                |
| <b>2016</b>  | 43                                                                                                                |
| <b>2017</b>  | 48                                                                                                                |
| <b>2018</b>  | 49                                                                                                                |
| <b>2019</b>  | 59                                                                                                                |
| <b>2020</b>  | 64                                                                                                                |

**Source:** World Bank data on the number of internet users in Algeria available on the site:  
 Internautes (% de la population) - Algérie |  
 des données (banquemondiale.org)  
 17/12/2023)

**Fig (3) :** the evolution of the proportion of Internet users in the total population in Algeria during the period (2000-2020)



Source: our own contribution

Figure (3) shows that it is clear that the number of internet users has seen a significant increase. Therefore, we can say that Algeria has made great progress in the development of the information and communication technology sector, the merit goes to a number of reforms that the sector has witnessed since the year 2000 (بن بوزة و بن زيان 2016 ص. 88)

\*modernization of communications infrastructure;

\* expanding the scope of services and improving their quality;

\*strengthening of information and communication technologies as a structuring element of digital development and a major factor in the competitiveness of the national economy.

Despite the positive statistics which testify to the development of the ICT sector, the reality of the performance of individuals and institutions which use them remains modest, particularly in the field of electronic commerce, digital education and even in digital work; which depends on organizational will to be effective on the ground.

### 3-2- An overview of the evolution of higher education indicators and employment with it relationship in Algeria during 2000-2020:

According to numerous studies such as (Ferroukhi 2005); And (Bouklia and Talahit 2008), there is an educational mismatch in the Algerian labor market which is represented by the high unemployment rate of higher education graduates.

The phenomenon of unemployment of higher education graduates experienced a significant increase during the period (2004-2019), knowing that in 2010 it recorded around 20.3%, and this phenomenon affects most countries in the MENA region, including it represents the result of economic and political reforms and rapid technological changes.

Table (4) and graph (4) represent the evolution of the unemployment rate according to the level of education in Algeria during the period 2004-2019.

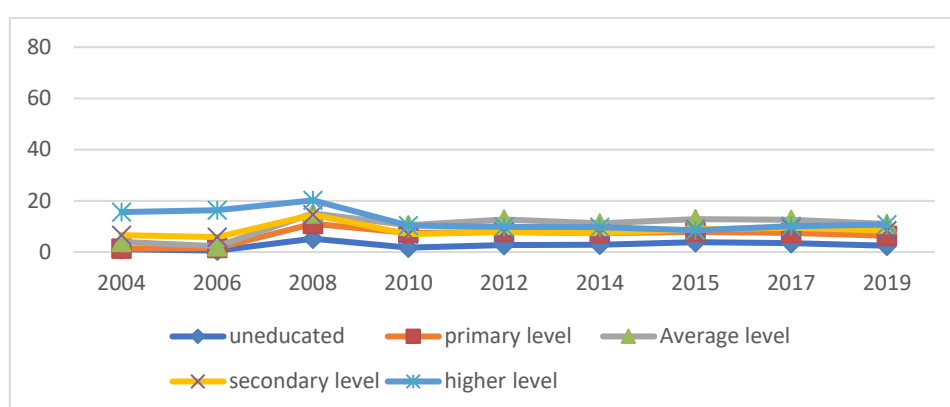
**Table (4):** the evolution of the unemployment rate according to the level of education in Algeria during the period 2004-2019

| Years | Uneducated | Primary level | Average level | Secondary level | Higher level |
|-------|------------|---------------|---------------|-----------------|--------------|
| 2004  | 1.34       | 1.43          | 3.96          | 6.6             | 15.61        |
| 2006  | 1.62       | 2.28          | 2.28          | 5.84            | 16.3         |
| 2008  | 5.22       | 11.03         | 14.58         | 14.58           | 20.18        |
| 2010  | 1.7        | 7             | 10.4          | 7               | 10.4         |
| 2012  | 2.7        | 7.9           | 12.7          | 7.9             | 9.8          |
| 2014  | 2.9        | 7.4           | 11.2          | 9.7             | 9.7          |
| 2015  | 3.9        | 8.5           | 12.9          | 8.5             | 12.9         |
| 2017  | 3.5        | 7.5           | 12.6          | 10.1            | 12.6         |
| 2019  | 2.5        | 6.4           | 11            | 10.7            | 10.7         |

Source: carried out from ONS employment surveys for the period (2004-2019)

**Fig (4):** the evolution of the unemployment rate according to the level of education in Algeria during the period 2004-2019

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Source: our own contribution

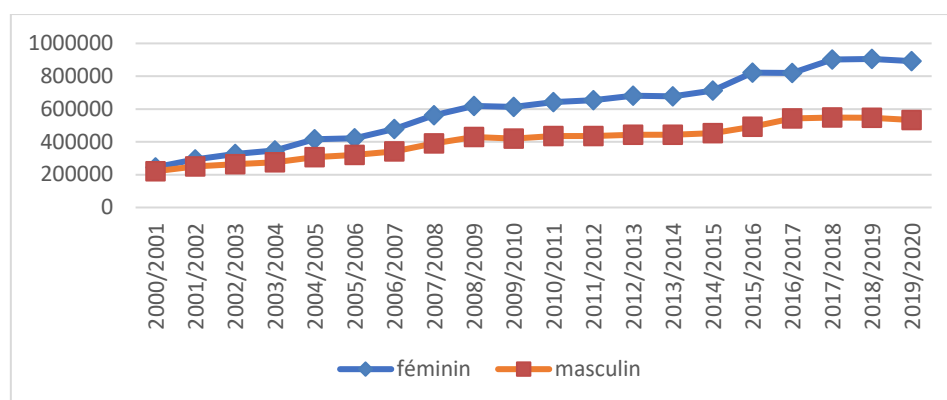
Concerning the higher education sector, we can say that it has experienced a significant evolution in the number of those enrolled in graduation and post-graduation as shown in the 5th and 6th table.

**Table 5:** the evolution of the number of those enrolled in graduation according to gender during 2000-2019

| College year | Feminine | Male   |
|--------------|----------|--------|
| 2000/2001    | 245244   | 26840  |
| 2001/2002    | 293652   | 250217 |
| 2002/2003    | 326933   | 263060 |
| 2003/2004    | 347374   | 275606 |
| 2004/2005    | 415242   | 306591 |
| 2005/2006    | 421862   | 321192 |
| 2006/2007    | 478546   | 342124 |
| 2007/2008    | 561545   | 390522 |
| 2008/2009    | 619648   | 429251 |
| 2009/2010    | 613565   | 436415 |
| 2010/2011    | 641530   | 436269 |
| 2011/2012    | 654323   | 443481 |
| 2012/2013    | 680953   | 442497 |
| 2013/2014    | 677018   | 153036 |
| 2014/2015    | 172004   | 492723 |
| 2015/2016    | 822097   | 492723 |
| 2016/2017    | 819651   | 492723 |
| 2017/2018    | 901592   | 548068 |
| 2018/2019    | 905213   | 546534 |

Source : it was developed based on statistics from the Ministry of Higher Education and Scientific Research in Algeria

**Fig (5):** the evolution of the number of those enrolled in graduation according to gender during 2000-2019



Source: our own contribution

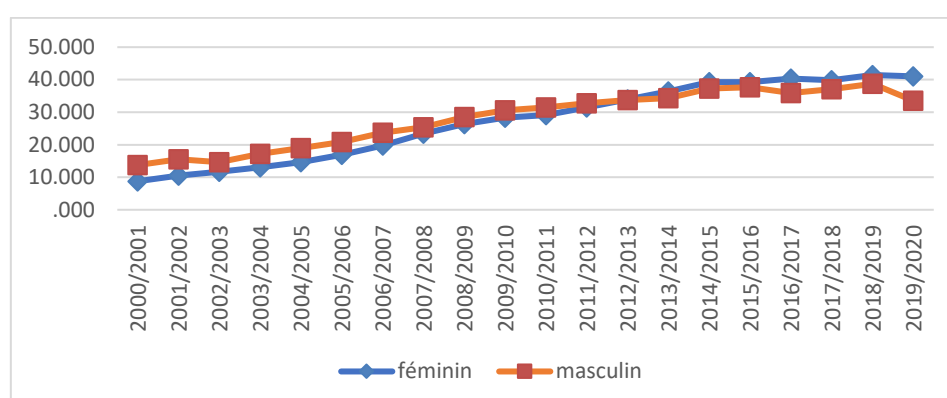
**Table (6):** the evolution of the number of those enrolled in post-graduation according to gender during 2000-2019

| College year | Feminine | Male  |
|--------------|----------|-------|
| 2000/2001    | 8775     | 13758 |
| 2001/2002    | 10484    | 15576 |
| 2002/2003    | 1167     | 14612 |
| 2003/2004    | 13038    | 17183 |
| 2004/2005    | 14670    | 1896  |
| 2005/2006    | 16912    | 20875 |
| 2006/2007    | 19778    | 23680 |
| 2007/2008    | 23441    | 25323 |
| 2008/2009    | 26366    | 28558 |
| 2009/2010    | 28344    | 30611 |
| 2010/2011    | 29129    | 31488 |
| 2011/2012    | 31434    | 32781 |
| 2012/2013    | 33781    | 33781 |
| 2013/2014    | 36430    | 34304 |
| 2014/2015    | 39264    | 37246 |
| 2015/2016    | 39244    | 37697 |
| 2016/2017    | 40329    | 35873 |
| 2017/2018    | 39813    | 37108 |
| 2018/2019    | 41440    | 38733 |

Source : it was developed based on statistics from the Ministry of Higher Education and Scientific Research in Algeria.

**Fig (6):** the evolution of the number of those enrolled in post-graduation according to gender during 2000-2019

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Source: our own contribution

The total number of students enrolled in higher education has increased considerably from 488,617 students enrolled in 2000 to 1,500,216 students enrolled in 2020; The post-graduation phase is also experiencing significant progression thanks to the increase in the number of registrants, which goes from 2000 registered in 22,533 registered in 200 to approximately 74,495 registered in 2019. Regarding the university training courses in the graduation and post-graduation phase there has also been a significant change, since the training offer is considerably expanded, particularly after the installation of the LMD reform.

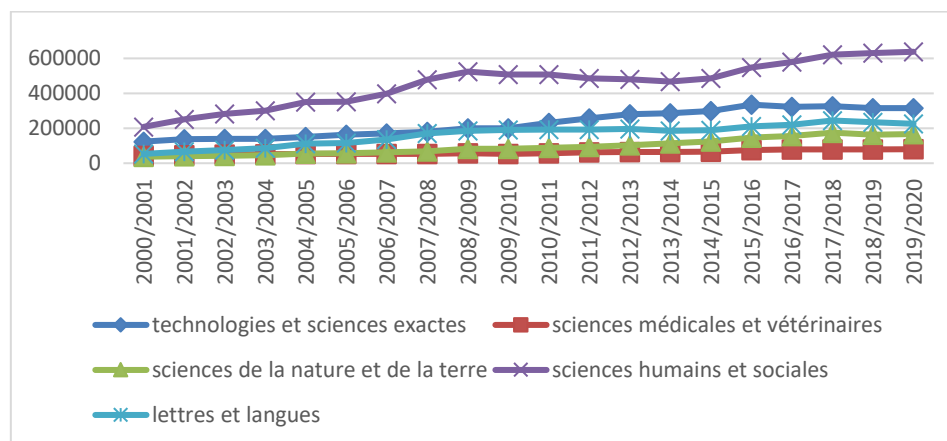
**Table (7):** the evolution of the number of registrants according to the main fields during the period 2000-2019

| College year | Technologies and exact sciences | Human and social sciences | Natural and earth sciences | Medical and veterinary sciences | Letters and languages |
|--------------|---------------------------------|---------------------------|----------------------------|---------------------------------|-----------------------|
| 2000/2001    | 123892                          | 208288                    | 37350                      | 42986                           | 53568                 |
| 2001/2002    | 137064                          | 251368                    | 251368                     | 46986                           | 67214                 |
| 2002/2003    | 139439                          | 283159                    | 42923                      | 49501                           | 74971                 |
| 2003/2004    | 139588                          | 300138                    | 45649                      | 50818                           | 86787                 |
| 2004/2005    | 150731                          | 349653                    | 54883                      | 53666                           | 112900                |
| 2005/2006    | 164226                          | 351958                    | 57609                      | 53405                           | 116456                |
| 2006/2007    | 170557                          | 397005                    | 63314                      | 53840                           | 135948                |
| 2007/2008    | 180407                          | 479005                    | 67797                      | 54221                           | 176637                |
| 2008/2009    | 200886                          | 524078                    | 82164                      | 56571                           | 185200                |
| 2009/2010    | 200036                          | 507771                    | 507771                     | 82111                           | 190548                |
| 2010/2011    | 231156                          | 507831                    | 88667                      | 57254                           | 193037                |
| 2011/2012    | 256918                          | 485162                    | 93159                      | 61837                           | 193516                |
| 2012/2013    | 280286                          | 479596                    | 103773                     | 64352                           | 196427                |
| 2013/2014    | 286852                          | 469596                    | 113649                     | 64915                           | 186205                |
| 2014/2015    | 299113                          | 4678940                   | 124245                     | 66447                           | 189645                |
| 2015/2016    | 335154                          | 485590                    | 146471                     | 75673                           | 216519.04             |
| 2016/2017    | 323639                          | 54866.248                 | 155283                     | 78916                           | 219685.122            |
| 2017/2018    | 326551                          | 579046.587                | 175109                     | 79032                           | 244554                |
| 2018/2019    | 315933                          | 622238                    | 164180                     | 79130                           | 234722                |

|           |        |        |        |       |        |
|-----------|--------|--------|--------|-------|--------|
| 2019/2020 | 315196 | 637901 | 166616 | 80246 | 225762 |
|-----------|--------|--------|--------|-------|--------|

**Source:** it was developed based on statistics from the Ministry of Higher Education and Scientific Research in Algeria

**Fig (7):** the evolution of the number of registrants according to the main fields during the period 2000-2019



**Source:** our own contribution

The previous graphs clearly show that the Algerian university during the period (2000-20219) experienced significant changes in their student population, and even the study specialties experienced changes including increases in the number of registered students. in human and social disciplines leading to a reduction in specializations linked to technological and exact sciences.

The number of higher education graduates also experienced significant growth as it rose to the 8th graph.

**Tab (8):** the evolution of the number of higher education graduates according to the main fields during the period 2000-2019

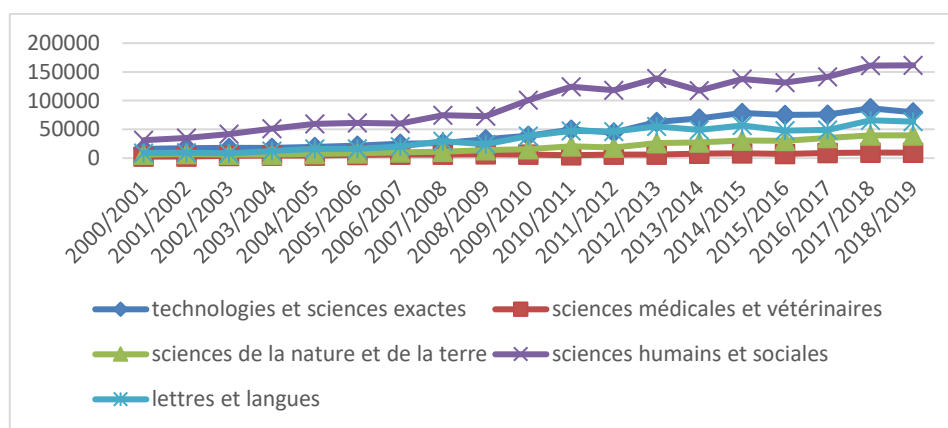
| College year | Technologies and exact sciences | Human and social sciences | Natural and earth sciences | Medical and veterinary sciences | Letters and languages |
|--------------|---------------------------------|---------------------------|----------------------------|---------------------------------|-----------------------|
| 2000/2001    | 16084                           | 31166                     | 6258                       | 6258                            | 9124                  |
| 2001/2002    | 17491                           | 35309                     | 7166                       | 3039                            | 9732                  |
| 2002/2003    | 17817                           | 41735                     | 6319                       | 3649                            | 8452                  |
| 2003/2004    | 17724                           | 50996                     | 6204                       | 4373                            | 12531                 |
| 2004/2005    | 19371                           | 59866                     | 7523                       | 4687                            | 16068                 |
| 2005/2006    | 21966                           | 61082                     | 8355                       | 5387                            | 16399                 |
| 2006/2007    | 25047                           | 59907                     | 10326                      | 5397                            | 20246                 |
| 2007/2008    | 26075                           | 74673                     | 10949                      | 6379                            | 29266                 |
| 2008/2009    | 32823                           | 72995                     | 13676                      | 10949                           | 24056                 |
| 2009/2010    | 39117                           | 100809                    | 15419                      | 6464                            | 38397                 |
| 2010/2011    | 49337                           | 124121                    | 20737                      | 15419                           | 47414                 |
| 2011/2012    | 44674                           | 118226                    | 18621                      | 20737                           | 46457                 |
| 2012/2013    | 62785                           | 138640                    | 26180                      | 18621                           | 46457                 |
| 2013/2014    | 69076                           | 117750                    | 27587                      | 26180                           | 55033                 |

## *ICT and the inadequacy of the relationship between higher education and employment “the case of Algeria”*

|                  |       |        |        |       |       |
|------------------|-------|--------|--------|-------|-------|
| <b>2014/2015</b> | 78370 | 137500 | 30796  | 7851  | 49166 |
| <b>2015/2016</b> | 75370 | 131731 | 131731 | 30796 | 56922 |
| <b>2016/2017</b> | 8801  | 141403 | 141403 | 30307 | 48083 |
| <b>2017/2018</b> | 86783 | 161230 | 39542  | 35146 | 48895 |
| <b>2018/2019</b> | 79761 | 161427 | 39667  | 39542 | 65796 |

**Source:** it was developed based on statistics from the Ministry of Higher Education and Scientific Research in Algeria

**Fig (8):** the evolution of the number of higher education graduates according to the main fields during the period 2000-2019)



**Source:** our own contribution

It emerges from the above that the specializations of higher education graduates have changed from the year 2000, where we find a large percentage of graduates leaving the human and social sciences sectors, unlike the medical, scientific and techniques.

### **3-3- ICT as a factor in the fight against the higher education-job match:**

Algeria's integration into the world of the digital economy depends on several factors and the creation of the ministry dedicated to the development of the digital economy (which was already carried out after 2019) is the most important of these factors.

The Algerian state has therefore revealed its keen interest in the field of information and communication technologies by giving priority to the transition to electronic government, and the strengthening of the digital environment not only enriches the national economy. but also improves employment opportunities

Increased connectivity can also transform standard economic development models in trade, investment and business from the usual to the immediate stages.

And accordingly, in order to bring positive changes in the digital economy action must be focused on ICT and improving access to the internet, and to achieve this goal electronic culture must be developed and legislation that supports online transactions must be implemented. (ABBAS and Hadj BENZIDANE 2019, pp.160-161)

Infrastructure development and expansion is also seen as an important factor in strengthening the ICT sector, and enabling services under the umbrella of electronic administration contributes to maintaining services privacy security and trust in a digital economy.

Regarding the higher education and scientific research sector, information and communication technologies have contributed positively to its development, particularly during the pandemic

period and beyond despite some shortcomings recorded due to lack of e-learning culture, they have contributed to the continuation of the work and communication of universities and research centers and their openness to the international environment to keep pace with the developments taking place in the scientific field.

The entrepreneurial aspect of the university was also known through university incubators to contribute to the creation of emerging "start-up" institutions, one of the most important new models of employment of university graduates, by helping owners of business creation ideas to contribute positively to economic development.

As for the labor market, self-employment models can be considered alongside emerging institutions "TEMTEM, YASSIR, RELAY, KOTOOB... etc " and also digital employment platforms " emploitic , ANEM wassitonline , TAWDIF... etc " in addition to the work technology " tele-working ", these new forms characterize the Algerian labor market today, and depend on legal legislation which guarantees the rights and duties of all their parties and the means in order to improve them, particularly in a global environment characterized by numerous changes.

According to the study (ZOUANE and Nasreddine BEDDI 2015, p.286) investment in ICT is very favorable because it offers additional employment opportunities and currently used recruitment methods dominated by the internet.

Therefore, to increase employment opportunities in ICT in Algeria, it is necessary to expand training in technological, IT and exact fields of study, and to diversify the ICT sectors with the aim of developing and responding to them. to rapid changes.

### **Conclusion**

Algeria, like the rest of the world, had to adopt an ICT sector development strategy, and it has made significant progress to achieve the digitalization of all government sectors, including the ICT sector. higher education, where digitalization has had a significant impact to ensure its process.

### **results:**

If we consider that higher education graduates, whatever their specializations, constitute the category most affected by high unemployment rates, they have used available social networks and digital platforms as a useful means to find work, therefore we can say that information and communication technologies have contributed proportionally to reducing the inadequacy of the higher education-employment relationship; but the development of ICT infrastructures, the improvement of their services and the reduction of their costs depend on more work, likewise it is necessary to ensure legal protection to preserve the rights and privacy of individuals and institutions and to motivate activists of creating beneficial digital content.

### **Suggestions:**

And finally, and in order to increase employment opportunities using ICT in Algeria, it is necessary to expand training in technological, computer and exact fields of study, and to diversify the ICT sectors in the aim of developing them and responding to rapid changes.

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